MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

BFS1024 – STATISTICS FOR FINANCE
(All sections / Groups)

07 MARCH 2018
9.00 a.m. - 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **9 pages** including statistical formulas and statistical tables with **4 questions** only.
2. Attempt **ALL** questions and write your answers in the Answer Booklet provided.
3. Students are allowed to use non-programmable scientific calculators that are permitted to be used in the examination.

Question 1 (25 Marks)

A Japanese company that manufactures batteries for cell phones has 2 basic products, both of which should produce a battery life of 600 minutes in standby mode. The operations manager decides to run a laboratory test on a sample of 5 of each type of battery to check their actual discharge time. The results (in minutes) ranked from smallest to largest are as follows:

Battery A					Battery B				
593	595	600	603	609	598	599	600	602	603

a) For each of the 2 battery types, determine the mean, median, and standard deviation. [10 marks]

b) Based on the measure of central location and measure of variability obtained in (a), what do the results tell you about the comparative quality of these 2 batteries? [5 marks]

c) What would be the effect on your answers in (a) and (b) if the last value for Battery B was 613 instead of 603. [10 marks]

Question 2 (25 Marks)

a) Based on Mega Holding's analysis of the future demand for its products, its financial department has determined that there is a 0.17 probability that the company will lose \$1.2 million during the next year, a 0.21 probability that it will lose \$0.7 million, a 0.37 probability that it will make a profit of \$0.9 million, and a 0.25 probability that it will make a profit of \$2.3 million. Let x be a random variable that denotes the profits earned by this company during the next year. Find the mean and standard deviation of the probability distribution of x. [10 marks]

b) The monthly sales in Little Greene Paint Colours, a luxury interior design paint company is approximately normally distributed with a mean of \$2.5million and standard deviation of \$300,000.

i. Find the probability that the total sales for a particular month is at least \$3 million. [5 marks]

ii. Determine the monthly sales level that has a 9% chance of being exceeded. [5 marks]

Continued...

c) Ibraheem majoring in Financial Engineering is trying to decide upon the number of firms to which he should apply for. With his excellent academic qualification and working experience, he believes that 80% of the firms will offer him a place. The student applies to only 5 firms. Assuming the student's estimation is correct, what is the probability that the student receives at most 2 offers? [5 marks]

Question 3 (25 Marks)

a) Goodyear Tires Malaysia which located at Subang Jaya currently produces tires at their plant during two 12-hour shifts. The night-shift employees are planning to ask for a raise because they believe they are producing more tires per shift than the day-shift. The production supervisor randomly selected some daily production runs from each shift with the results given below (in 1,000s of tires produced).

Shift	Production (in 1,000s)								
Day	107.5	118.6	124.6	101.6	113.6	119.6	120.6	109.6	105.9
Night	115.6	109.4	121.6	128.7	136.6	125.4	121.3	180.6	117.5

At 5 percent significance level, do these data indicate that the night shift is producing more tires per shift? [14 marks]

b) An auditor committee randomly samples 32 accounts receivable from a consulting firm and checks the accounts to verify that all documents for the accounts comply with company procedures or not. Ten of the 32 accounts are found to have documents not in compliance.

i. Construct a 90% confidence interval estimate for the proportion of accounts with documents that do not comply with company procedures. [6 marks]

ii. Suppose that the auditor committee wants to conduct another account audit from other consulting firm. Using sample proportion in (i), what is the required sample size to estimate the population proportion to within $\pm 4\%$ with 90 percent confidence? [5 marks]

Continued...

Question 4 (25 Marks)

There is a study to predict the sale price of a residential property (in RM). Data is taken on 20 randomly selected properties. The potential predictors in the study are appraised land value (in RM), appraised value of improvements (in RM) and area of property living space (square feet).

The data are analysed to assess any significant association of the factors toward the sale price of the residential property. The summary of regression output was presented as below:

ANOVA

	df	*SS*	*MS*
Regression	3	877967	292655
Residual	16	100349	627182
Total	19	978316	

	Coefficients	*Standard Error*	*t Stat*
Intercept	1470.276	5746.325	
Land_value	0.814	0.512	
Improve_value	0.96	0.211	
Area	16.373	6.586	

a) Develop an estimated multiple linear regression equation for the above data. [4 marks]

b) Interpret the slope coefficient for the area of property living space relating to the sale price of residential property. [2 marks]

c) Compute the adjusted R-square and interpret its meaning. [6 marks]

d) At the 5% level of significance, test the significance of each predictor in estimating the sale price of a residential property. Which of the predictors is significant? [9 marks]

e) Predict the sale price of a residential property when the appraised land value is RM8000, the appraised value of improvements is RM20,000 and area of property living space is 1200 square feet. [4 marks]

End of Page

A. DESCRIPTIVE STATISTICS

Mean = $\dfrac{\sum X_i}{n}$

Standard Deviation (s) = $\sqrt{\dfrac{\sum X^2}{n-1} - \dfrac{(\sum X)^2}{n(n-1)}}$

Pearson's Coefficient of Skewness (S_k) = $\dfrac{3(\overline{X} - \text{Median})}{s}$ or $\dfrac{\overline{X} - \text{Mode}}{s}$

B. PROBABILITY

P (A or B) = P (A) + P (B) - P (A and B)

P (A and B) = P (A) P (B) if A and B are independent

P (A | B) = P (A and B) / P (B)

Poisson Probability Distribution

If X follows a Poisson Distribution P (λ) where $P(X = x) = \dfrac{e^{-\lambda}\lambda^x}{x!}$

then the mean = E(X) = λ and variance = VAR(X) = λ

Binomial Probability Distribution

If X follows a Binomial Distribution B(n, p) where $P(X = x) = {}^nC_x p^x q^{n-x}$

then the mean = E(X) = n p and variance = VAR(X) = npq where q = 1 - p

Normal Distribution

If X follows a Normal distribution N(μ , σ) where E(X) = μ and VAR(X) = σ^2

then $z = \dfrac{X - \mu}{\sigma}$

C. EXPECTATION AND VARIANCE OPERATORS

E (X) = Σ[X • P(X)]

VAR (X) = $E(X^2) - [E(X)]^2$

If E (X) = μ then E (kX) = k μ, E(X + Y) = E(X) + E(Y)

If VAR (X) = σ^2 then VAR (kX) = $k^2\sigma^2$,

VAR (aX + bY) = a^2VAR(X) + b^2VAR(Y) + 2ab COV(X, Y)

where COV(X, Y) = E(XY) – [E(X) E(Y)]

D. CONFIDENCE INTERVAL ESTIMATION AND SAMPLE SIZE DETERMINATION

(100 - α) % Confidence Interval for Population Mean (σ Known) = $\overline{X} \pm Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$

(100 - α)% Confidence Interval for Population Mean (σ Unknown) = $\overline{X} \pm t_{\alpha/2,n-1}\left(\frac{s}{\sqrt{n}}\right)$

(100 - α)% Confidence Interval for Population Proportion = $p \pm Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}$

Sample Size Determination for Population Mean $= n \geq \frac{(Z_{\alpha/2})^2\sigma^2}{E^2}$

Sample Size Determination for Population Proportion $= n \geq \frac{(Z_{\alpha/2})^2 p(1-p)}{E^2}$

Where E = Limit of Error in Estimation

E. HYPOTHESIS TESTING

One Sample Mean Test	
Standard Deviation (σ) Known	**Standard Deviation (σ) Not Known**
$Z = \frac{\overline{x}-\mu}{\sigma/\sqrt{n}}$	$t = \frac{\overline{x}-\mu}{s/\sqrt{n}}$
One Sample Proportion Test	
$Z = \frac{p-\pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$	

Two Sample Mean Test
Standard Deviation (σ) Known $z = \dfrac{(\overline{x}_1 - \overline{x}_2)}{\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}}$ **Standard Deviation (σ) Not Known** $t = \dfrac{(\overline{x}_1 - \overline{x}_2)}{\sqrt{S_p^2\left(1/n_1 + 1/n_2\right)}}$ **where** $S_p^2 = \dfrac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{(n_1-1)+(n_2-1)}$

Two Sample Proportion Test
$z = \dfrac{(p_1 - p_2)}{\sqrt{p(1-p)\left[\dfrac{1}{n_1} + \dfrac{1}{n_2}\right]}}$ where $p = \dfrac{(n_1 p_1) + (n_2 p_2)}{n_1 + n_2} = \dfrac{X_1 + X_2}{n_1 + n_2}$ where X_1 and X_2 are the number of successes from each population

F. REGRESSION ANALYSIS

SIMPLE LINEAR REGRESSION:

Correlation Coefficient

$$r = \frac{\sum XY - \left[\frac{\sum X \sum Y}{n}\right]}{\sqrt{\left[\sum X^2 - \left((\sum X)^2/n\right)\right]\left[\sum Y^2 - \left((\sum Y)^2/n\right)\right]}} = \frac{COV(X,Y)}{\sigma_X \sigma_Y}$$

Regression Coefficient

$$b_1 = \frac{\sum XY - \left[\frac{\sum X \sum Y}{n}\right]}{\left[\sum X^2 - \left((\sum X)^2/n\right)\right]}, \qquad b_0 = \overline{Y} - b_1\overline{X}$$

MULTIPLE LINEAR REGRESSION:

Adjusted r-square $= 1 - \left[\dfrac{(1-r^2)(n-1)}{(n-p-1)}\right]$ where $p =$ number of independent variables

ANOVA Table for Multiple Linear Regression

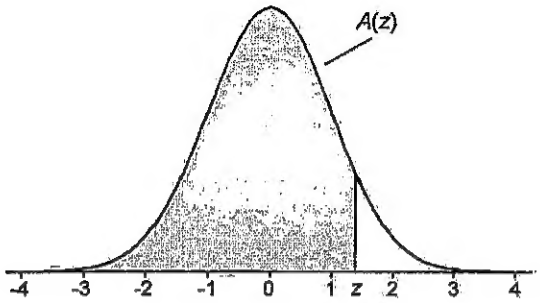
Source	Degrees of Freedom	Sum of Squares	Mean Squares
Regression	p	SSR	MSR = SSR/p
Error	$n-p-1$	SSE	MSE = SSE/($n-p-1$)
Total	$n-1$	SST	

Test Statistic for Significance of the Overall Regression Model = F = MSR/MSE

Test Statistic for Significance of each Explanatory Variable = $t^* = b_i / S_{bi}$ and the Critical $t = t_{(n-p-1),\alpha/2}$

TABLE A.1

Cumulative Standardized Normal Distribution



$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:

z	$A(z)$	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

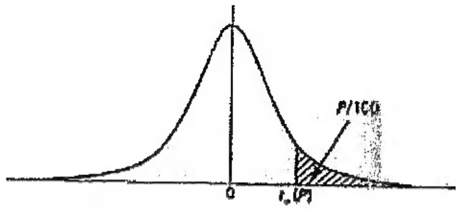
z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							

TABLE 10. PERCENTAGE POINTS OF THE t-DISTRIBUTION

This table gives percentage points $t_\nu(P)$ defined by the equation

$$\frac{P}{100} = \frac{1}{\sqrt{\nu\pi}} \frac{\Gamma(\frac{1}{2}\nu+\frac{1}{2})}{\Gamma(\frac{1}{2}\nu)} \int_{t_\nu(P)}^{\infty} \frac{dt}{(1+t^2/\nu)^{\frac{1}{2}(\nu+1)}}.$$

Let X_1 and X_2 be independent random variables having a normal distribution with zero mean and unit variance and a χ^2-distribution with ν degrees of freedom respectively; then $t = X_1/\sqrt{X_2/\nu}$ has Student's t-distribution with ν degrees of freedom, and the probability that $t \geqslant t_\nu(P)$ is $P/100$. The lower percentage points are given by symmetry as $-t_\nu(P)$, and the probability that $|t| \geqslant t_\nu(P)$ is $2P/100$.



The limiting distribution of t as ν tends to infinity is the normal distribution with zero mean and unit variance. When ν is large interpolation in ν should be harmonic.

P	40	30	25	20	15	10	5	2·5	1	0·5	0·1	0·05
ν = 1	0·3249	0·7265	1·0000	1·3764	1·963	3·078	6·314	12·71	31·82	63·66	318·3	636·6
2	0·2887	0·6172	0·8165	1·0607	1·386	1·886	2·920	4·303	6·965	9·925	22·33	31·60
3	0·2767	0·5844	0·7649	0·9785	1·250	1·638	2·353	3·182	4·541	5·841	10·21	12·92
4	0·2707	0·5686	0·7407	0·9410	1·190	1·533	2·132	2·776	3·747	4·604	7·173	8·610
5	0·2672	0·5594	0·7267	0·9195	1·156	1·476	2·015	2·571	3·365	4·032	5·893	6·869
6	0·2648	0·5534	0·7176	0·9057	1·134	1·440	1·943	2·447	3·143	3·707	5·208	5·959
7	0·2632	0·5491	0·7111	0·8960	1·119	1·415	1·895	2·365	2·998	3·499	4·785	5·408
8	0·2619	0·5459	0·7064	0·8889	1·108	1·397	1·860	2·306	2·896	3·355	4·501	5·041
9	0·2610	0·5435	0·7027	0·8834	1·100	1·383	1·833	2·262	2·821	3·250	4·297	4·781
10	0·2602	0·5415	0·6998	0·8791	1·093	1·372	1·812	2·228	2·764	3·169	4·144	4·587
11	0·2596	0·5399	0·6974	0·8755	1·088	1·363	1·796	2·201	2·718	3·106	4·025	4·437
12	0·2590	0·5386	0·6955	0·8726	1·083	1·356	1·782	2·179	2·681	3·055	3·930	4·318
13	0·2586	0·5375	0·6938	0·8702	1·079	1·350	1·771	2·160	2·650	3·012	3·852	4·221
14	0·2582	0·5366	0·6924	0·8681	1·076	1·345	1·761	2·145	2·624	2·977	3·787	4·140
15	0·2579	0·5357	0·6912	0·8662	1·074	1·341	1·753	2·131	2·602	2·947	3·733	4·073
16	0·2576	0·5350	0·6901	0·8647	1·071	1·337	1·746	2·120	2·583	2·921	3·686	4·015
17	0·2573	0·5344	0·6892	0·8633	1·069	1·333	1·740	2·110	2·567	2·898	3·646	3·965
18	0·2571	0·5338	0·6884	0·8620	1·067	1·330	1·734	2·101	2·552	2·878	3·610	3·922
19	0·2569	0·5333	0·6876	0·8610	1·066	1·328	1·729	2·093	2·539	2·861	3·579	3·883
20	0·2567	0·5329	0·6870	0·8600	1·064	1·325	1·725	2·086	2·528	2·845	3·552	3·850
21	0·2566	0·5325	0·6864	0·8591	1·063	1·323	1·721	2·080	2·518	2·831	3·527	3·819
22	0·2564	0·5321	0·6858	0·8583	1·061	1·321	1·717	2·074	2·508	2·819	3·505	3·792
23	0·2563	0·5317	0·6853	0·8575	1·060	1·319	1·714	2·069	2·500	2·807	3·485	3·768
24	0·2562	0·5314	0·6848	0·8569	1·059	1·318	1·711	2·064	2·492	2·797	3·467	3·745
25	0·2561	0·5312	0·6844	0·8562	1·058	1·316	1·708	2·060	2·485	2·787	3·450	3·725
26	0·2560	0·5309	0·6840	0·8557	1·058	1·315	1·706	2·056	2·479	2·779	3·435	3·707
27	0·2559	0·5306	0·6837	0·8551	1·057	1·314	1·703	2·052	2·473	2·771	3·421	3·690
28	0·2558	0·5304	0·6834	0·8546	1·056	1·313	1·701	2·048	2·467	2·763	3·408	3·674
29	0·2557	0·5302	0·6830	0·8542	1·055	1·311	1·699	2·045	2·462	2·756	3·396	3·659
30	0·2556	0·5300	0·6828	0·8538	1·055	1·310	1·697	2·042	2·457	2·750	3·385	3·646
32	0·2555	0·5297	0·6822	0·8530	1·054	1·309	1·694	2·037	2·449	2·738	3·365	3·622
34	0·2553	0·5294	0·6818	0·8523	1·052	1·307	1·691	2·032	2·441	2·728	3·348	3·601
36	0·2552	0·5291	0·6814	0·8517	1·052	1·306	1·688	2·028	2·434	2·719	3·333	3·582
38	0·2551	0·5288	0·6810	0·8512	1·051	1·304	1·686	2·024	2·429	2·712	3·319	3·566
40	0·2550	0·5286	0·6807	0·8507	1·050	1·303	1·684	2·021	2·423	2·704	3·307	3·551
50	0·2547	0·5278	0·6794	0·8489	1·047	1·299	1·676	2·009	2·403	2·678	3·261	3·496
60	0·2545	0·5272	0·6786	0·8477	1·045	1·296	1·671	2·000	2·390	2·660	3·232	3·460
120	0·2539	0·5258	0·6765	0·8446	1·041	1·289	1·658	1·980	2·358	2·617	3·160	3·373
∞	0·2533	0·5244	0·6745	0·8416	1·036	1·282	1·645	1·960	2·326	2·576	3·090	3·291

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